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Weather at Picking Time of Hops, its Effect on Quality

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Previous work had suggested that the weather immediately previous to time of picking might have an effect on quality. A scrutiny of the Belgian data (on Northern Brewer hops) used in Ag. Mem. No. 316 appears to give support to this hypothesis. (Temperatures quoted are those for Uccle, Brussels)

Year	Maximum α-acid (%) Q	Mean Temperature (°C) July 1 to picking date A (below 18°)	B (above 18°)	Mean Maximum Temperature (°C) Sampling Day & Previous Day X	Previous two days to Sampling Day Y
1958	16.6	0.0		27.5	30.5
1959	16.0		1.6	23.5	25.5
1964	16.0		0.3	22.5	26.0
1968	15.3	0.6		20.5	19.5
1961	14.8	0.9		20.5	20.5
1963	14.7	1.2		18.0	20.0
1960	14.6	1.5		19.0	20.5
1966	14.0	1.2		19.0	19.5
1965	13.8	1.5		18.5	20.5
1967	13.8		0.5	20.5	20.0
1962	13.3	1.8		18.0	17.5

The correlation between Q and X is +0.85
Q and Y is +0.88
Q and A or $\frac{1}{2}$B is +0.90 (omitting 1967)

A previous α- acid formula (Ag. Mem.316) was

$$Q = 16.25 - 1.5A - 0.2B \quad (1)$$

incorporating X or Y gives

$$Q = 14.35 - 1.23A - 0.16B + 0.08X, \text{ or} \quad (2)$$
$$Q = 14.54 - 1.21A - 0.17B + 0.066Y \quad (3)$$

The results being:-

Year	Actual Quality (Q)	Estimated Quality (% alpha-acid) 1	2	3
1958	16.6	16.25	16.55	16.55
1959	16.0	15.95	15.95	15.95
1964	16.0	16.25	16.1	16.2
1968	15.3	15.35	15.25	15.1
1961	14.8	14.9	14.9	14.8
1963	14.7	14.45	14.3	14.4
1960	14.6	14.0	14.0	14.1
1966	14.0	14.45	14.4	14.4
1965	13.8	14.0	14.0	14.1
1967	13.8	16.15	15.9	15.8
1962	13.3	13.55	13.6	13.5
	Mean error (omitting 1967)	0.25	0.22	0.22

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If the effect of the maximum temperature on the day of picking and/or the two previous days is a real one, then it should have a visible effect on the samples taken at various dates in any one year, although sample qualities prior to maximum (or full maturity) are not strictly comparable.

Examination of the individual years give the following results

Year	Number of Samples	Correlation Coefficients Q and X	Q and Y
1958	6	0.18	0.81
1959	6	0.34	0.85
1960	6	-0.65	0.42
1961	2	insufficient data	
1962	13	0.67	0.65
1963	12	-0.61	-0.07
1964	15	0.40*	0.70*
1965	1	insufficient data	
1966	2	insufficient data	
1967	8	0.59	-0.12
1968	3	insufficient data	

*Certain high day temperatures in 1964 appeared to depress the yield, the correlation was made after adjusting for this effect (see later).

This is not entirely satisfactory but the years of negative correlations were such that there was either little variation in day maxima or in quality, this could have masked the effect of warm days versus cold days.

On the whole the relation with factor Y (the mean maximum of the two days previous to picking) seems the most promising.

The details for 1964 are as follows

1964 Date	Mean Maximum Temperature at Uccle over the two days previous to sampling (°C)		Alpha-acid(%)	Mean Temperature 1 July to date
18 Aug	26.0		16.0	18.35
17 Aug	25.5		15.7	18.33
28 Aug		33.0	15.4	18.34
19 Aug	22.5		15.4	18.27
26 Aug	24.5		15.3	18.17
16 Aug	22.0		15.3	18.31
27 Aug		29.5	15.2	18.30
29 Aug		30.5	15.0	18.29
25 Aug	22.0		14.9	18.04
1 Sept	18.5		14.8	18.02
31 Aug	18.5		14.8	18.10
30 Aug	23.0		14.8	18.19
15 Aug	20.0		14.5	18.28
24 Aug	21.5		14.4	17.99
20 Aug	18.5		14.3	18.18
23 Aug	21.0		13.8	18.01
21 Aug	16.5		13.8	18.14
14 Aug	17.0		13.8	18.29
22 Aug	21.0		13.7	18.01

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The quality appears to have varied in conformation with both the criteria but a day maximum of 26-28°C appears to be an optimum for the weather immediately preceding picking.

In 1962 and 1963 the evidence is nothing like so convincing, although some support for the theory that recent warmth can be beneficial could be deduced.

It is suggested that there is sufficient evidence to encourage further experiments regarding the optimum date of picking. Clear-cut results can only be expected if there is considerable variation in warmth over the picking period. From the evidence of the previous Ag Mem, it is thought that the mean temperature over the (approx) 60 day period is the dominant factor, but choice of date of picking may be significant.

Any comments or suggestions on this paper should be referred to the Author.

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